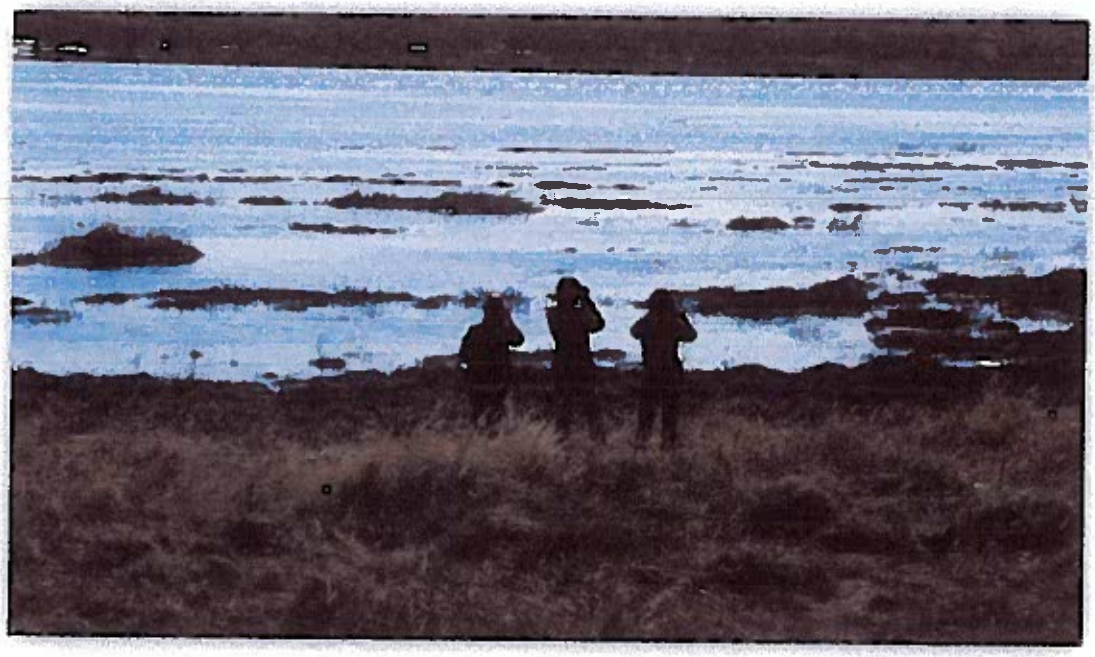
Expedition Anadyr 2011: Project Goals



We will collect data about climate conditions, flora and fauna of the Anadyr estuary. We will research the role of Anadyr estuary as a possible breeding ground for an increasing number of migrating birds as climates warm and birds move north.

We will:

1. Collect stories on the history from local residents and hunters about the effects of climate change in their lives and the lives of animals.
2. Collect baseline data on plants and animals for comparison in the future.
3. Research carbon emissions on both different types of tundra.
4. Develop the habits and ability to use another language.
5. Become aquatinted with and compare cultures and traditions of the people of Anadyr (Chukotka) and Alaska.

Because of the climate changes in Chukotka, more and more birds might be appearing. We hope that residents of Chukotka will try to guard the environment and keep it in the same condition as it is today.

Цель проекта:

Сбор данных о климатических условиях, флоре и фауне окрестностей Анадырского лимана. Исследование роли Анадырского лимана, как возможного места для гнездовья большего количества видов мигрирующих птиц.

Задачи проекта:

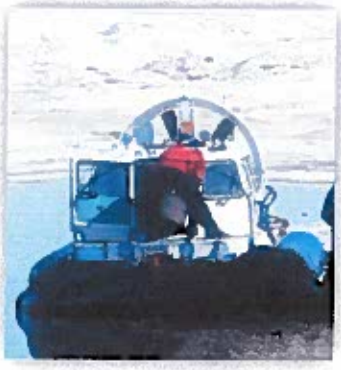
1) Собрать сведения на основе рассказов охотников и коренных жителей о том, как изменение климата влияет на их жизнь и жизнь животных (К примеру, лежбища моржей, ранее находившиеся на льду, ныне находятся на берегах)
2) Составить базу данных по птицам и растениям для сравнения через 5-10 лет.
3) Исследовать уровень выделения углерода на территории поврежденной и неповрежденной тундры.
4) Развивать навыки общения на иностранном языке.
5) Ознакомиться и сравнить культуру и традиции жителей Чукотки и Аляски.

Expedition Anadyr 2011 – Trip Summary

The Beginning: Anadyr group first met in Mrs. Whaley's classroom to discuss the National Park Service grant given to West High School to take a small group of willing students across the Bering Strait to study environmental impact in Anadyr, Russia. Anadyr is a remote coastal town only accessible by plane. The estuary surrounding Anadyr has been classified an Important Bird Area and remains essential habitat for many migrating bird species. We would be researching and producing a three part project. We would be surveying local bird populations and measuring the release of Carbon Dioxide gas from the tundra, as well as making a survey of tundra vegetation. Our group would collect stories from the locals and natives and gain their perspective on how climate change affects day-to-day life.

We hoped to raise awareness about climate change and encourage active protection of the tundra and estuary environments. Although the people in our group came from different backgrounds, we were all excited to collaborate with the Russian high school students in Anadyr. Four of the teens in our group had been taking Russian: Lizzie Bjorklund, Zoë Danner, Thomas Sawden, and Natasha Adler, not to mention the Russian teacher, Mrs. Whaley. Sarah Warnock of Alaska Geographic, Sarah's son, Noah Warnock, Mariah Savoie, and Rachelle Russo would also be going for the cultural exchange. They would be relying upon the Russian students for help understanding the locals and the culture.

We met at the Ted Stevens international airport at 4:30 am, exceedingly tired and unprepared for a long journey. We arrived in Nome in the early afternoon and spent a few hours walking around downtown, seeing the sights and gaining knowledge on the town's local history. We took a cab ride out to Safety Sound to see Muskox and watch biologist do bird surveys on the tundra. A few hours later we headed back to Bering Air to load up our chartered plane and begin the short hop across the Bering Sea. The flight was a remarkably short two hours, made pleasant by the spectacular ice sheets below and the slowly approaching Asiatic land mass ahead. We arrived twenty two hours into the future.



Thursday, May 26th

The plane landed in Anadyr's partially military airport and we waited for twenty minutes or so as Russian customs agents checked our visas and passports. We were led through a long and winding hall, ending at a small room where we filled out compact immigration cards. We then had to pass a long, silent, and extremely

uncomfortable security checkpoint where militarized customs agents filled out papers and stared intently at us. Finally, we stepped out into the drizzly Russian afternoon. We piled into taxis which brought us to the edge of the Anadyran River. We would be crossing in Padushkas, large fan-powered boats with inflatable bottoms enabling them to skip and skim over the treacherous sea ice. The trip across took roughly twenty minutes, and before we knew it, the city of Anadyr was in sight. After a short drive, we ended up at the Lyceum, a local school that would be hosting us for the next two weeks.

Our rooms were small but comfortable. Rachelle, Zoë, and Lizzy shared one room, Aviva, Natasha, and Mariah occupied another, and Noah and Thomas stayed across the hall. After settling in, we were fed a meal of Russian-style cafeteria food, which consisted of borscht, compote, and Russian bread. We then proceeded to a fairly large computer lab to become acquainted with Russian Lyceum students. All of them smiled nervously and laughed among themselves as we filed into the room. The English teacher, Natalia Vladmirovna had us play name games with the Russian students we would get to know so well over the next two weeks. . After a few hours of games, we were led into the cafeteria (or canteen, as they called it) and fed goulash with buckwheat, onion salad, and compote for dinner. At about 7:30 we fell into bed, exhausted.

Friday, May 27th

At eight the next morning, we were led by Dasha to the canteen for a breakfast of square eggs and delicious Russian bread, all washed down with a dark sweet tea. Thomas and Noah's room soon became established as the main hang-out spot, as it had the best lighting (the window faced east), and the best atmosphere. Following our rest, we teamed back up with the Russians for a guided tour of Anadyr.

As we walked out of the building, Ms. Whaley paired each American with a Russian guide, whom they got to know fairly well during the three-hour tour. Hospitals, schools, and apartment buildings lined the main streets, splashed with a vibrant variety of colors, adding a vivid charm to the partially decrepit structures. Our Russian companions all spoke excellent English, making communication between parties fluid. Zoë, Thomas, Natasha, and Liz all enjoyed talking with their guides in Russian and trying to improve their language skills. Following the tour, we returned to the lyceum and ate a lunch of salmon soup, rice with beets and beef, and bread and compote.

Later, back at the Lyceum, we played charades with the Russians, which turned out to be surprisingly fun given the language barrier. At 6:00, we ate dinner in a fairly small kitchen on the third floor of the lyceum, where we were always served by a charming Russian woman, the "house mother" for the entire

school. After dinner, Lizzy, Noah, Natasha, and Thomas went for a walk, and Aviva, Zoë and Mariah went for a run.

Saturday, May 28th

Breakfast the next morning was interesting, consisting of a thick white porridge filled with cheese and served with hot chocolate and bread.

Later we strolled (Russians do a lot of that, as most of them don't own cars) down to the local college where students go to learn technical skills. At the college, we attended a native dancing and poetry concert, which was very interesting to compare to the native Alaskan dances we were familiar with. The show was followed by a tour of the coastal section of Anadyr where we saw the shipping ports, many boats, and a Soviet-Era statue of Lenin. Dinner was composed of a chicken and potato stew with a hot pink beet salad. Bed at 11.

Sunday, May 29th

The following day, we were woken up earlier than usual to walk to the college for breakfast. However, the breakfast memo had not arrived, so we returned hungry to the Lyceum. Oatmeal, apples, and granola bars for breakfast! That morning, Sarah explained the structure of the project. There are two general groups: research and production. The production team consisted of Zoë and Liz taking pictures and videos and Natasha and Mariah writing, and the research team featured Thomas and Rachelle doing carbon readings and Noah and Aviva watching birds. After breakfast, at 9:10, we left the Lyceum to go to the tundra to gather information on bird and plants. The weather shifted to our liking, with bright blue skies, no clouds to be seen, and nice, warm temperatures. We left the small town behind and walked along the dusty road. We walked for about an hour until we found a suitable spot to sit down and listen to a lecture on tundra plants and birds. Sarah told us that disturbed tundra could take at least one hundred years to completely come back to its pure natural state. We squished across the mud and found a small hill that was out of the wind to continue our observations. Noah set up the scope to spot birds, while we searched the sky for movement and listened to Sarah talk to us about our projects. We arrived back in the Lyceum in time for lunch and project time with the Russians. Dinner was at the college.

Monday, May 30th

We rose bright and early at 6:00 in the morning to get out on the tundra on time. At 7:00 everyone trooped out and began the long walk to the tundra. We completed bird and plant surveys throughout the estuary. After several hours, we headed back to town to take a tour of the local art school. A woman took us on a tour through a school, showing us pictures and bone carvings all done by young students aged 5-18.

She showed us remarkable works of art done by young children and proceeded to show us a bone carving demonstration done by one of the teachers. In less than 20 minutes, he produced a smooth, polished, and beautiful work of art. After the tour, we had lunch then rested in our rooms for an hour before our dance lesson.

Our instructor was a native Chukotkan named Vlad, whom we saw at the concert a few days before. He taught us to dance like whales, shrimp, waves, and even seaweed. Although we all felt ridiculous, we had a great time anyway. After the dancing lesson, we hurriedly ate dinner and rushed upstairs to put on warm clothing for our trek into the tundra. We were going to be interviewed by the local television station and broadcast all over Chukotka. They wanted to capture us in action, and before we knew it we were out on the tundra being filmed taking CO_2 measurements and looking at birds. After working, Zoë, Thomas, and Noah were interviewed by news reporters as the rest of us piled into the van. We spent the rest of our evening talking.

Tuesday, May 31,

We woke up early and had oatmeal for breakfast. Our long trek to the tundra seemed shorter than usual, as our legs were getting strong from all the hiking and stair climbing that comes along with living in Anadyr. There was an unusual amount of heavy fog obscuring our view of the horizon, making bird watching much more difficult. We shared snacks and huddled with the Russians, packing together like penguins to conserve body heat before continuing on our way to set of plant surveys and CO_2 test sites. Soon after we finished, the fog lifted and the town suddenly appeared out of nowhere. When we got back we had an hour until our final dance lesson with Vlad.

At 7:00 we gathered into the gym for some sports with the Russians, led by an ex-Soviet Olympic coach. We played games like volleyball and basketball, and had a blast. We invited the Russians to tea in our rooms, but there was no tea! We improvised and had American candies and chocolate instead. We talked for an hour then crashed out in our beds as soon as they left.

Wednesday, June 1,

We finally got to sleep in until 7:30 again and had breakfast in the cafeteria. Directly after breakfast we headed out to the tundra again with the Russians. At Ruff Point we split into two teams, one for bird observation the other for plant surveying and CO_2 testing. After we completed our jobs we huddled

together for warmth while sharing a magnificent lunch with Russian tea, bread, salami, cheese, Russian candy, tea cookies, apples, and piroshky (Russian jelly cookies).

We traipsed back to Anadyr and went to the school of arts for a music concert. We were treated to songs played on a variety of instruments, from guitars to accordions. At 8:00 was the disco, where lights flashed, songs (both in English and Russian) blared, and people danced up and down to the beat. We danced with our Russian friends until 10:00. We all came upstairs, exhausted.

Thursday, June 2,

We woke up at 7:40 and had breakfast, and went to our Russian lesson at 9:00. At 10:30 we went to the museum for a tour with Natalia. The exhibits there had many artifacts from the Chukotka people and told a lot about their history. After lunch we had "Games" with the Russians, and competed with each other in groups of Americans and Russians. Later we worked on our project in the lab and listened to a native lady named Fatimah tell us about her experiences surviving in the Chukotkan tundra.

Friday, June 3, and Saturday, June 4

Both days were quieter, and spent mostly on the project and out on the tundra for a last chance to collect data. We had a nice tour at a magnificent Russian church, and another at the Children's Creativity Palace, where they showed us native dances and offered us a traditional tundra tea with food from the land – berries, native leaves soaked in seal oil, and other actually delicious treats. The next day we got together with the Russians and had a cooking lesson, where we made crepes stuffed with ham and cheese, apple pastries, ham and ketchup pizza, and herring and potato pastries, also delicious. Later we brought the food to the lab and ate our freshly cooked food and played games, both in Russian and English. We quieted down with some tea and Russian sweets, and finished the evening with singing, games, and bed.

Sunday, June 5th

Today was our last day in Anadyr. We got up early in the morning to say goodbye to our Russian friends. We took two padushkas across the Anadyr River to the airport. After waiting several hours in the main terminal for our authorization to come through, we climbed onto our Nome-bound plane. We arrived in Nome in the past. Several hours later, we arrived in Anchorage exhausted and glad to be home, yet sad at leaving Chukotka.

Bird, Plant and Carbon Dioxide Parameters of
Anadyr, Chukotka Autonomous Region, Russia:
A collection of baseline data for use
in future climate change studies

Conducted by Students of *Expedition Anadyr 2011*
West High, Anchorage Alaska and Lyceum, Anadyr, Chukotka, Russia

Abstract

From May 25 to June 6 2011, eight high school students from Anchorage, Alaska and ten from the Russian city of Anadyr came together in the Chukotkan capital for a cultural exchange and shared learning experiences, under the auspices of the Shared Beringian Heritage Program of the U.S. National Park Service. One purpose of the science aspect of the program was to investigate climate change effects in this subarctic community. By collecting oral histories from local Chukotka elders, we learned that winters in Anadyr are warmer than in the past, and that plants and animals are changing their patterns. To support the evidence from traditional knowledge, we surveyed plant and bird populations and created a data set that could possibly be used as reference points for future climate change studies. We documented the total number of species of birds seen during the 10-day period and recorded population size in town, river and tundra study areas. We also selected tundra vegetation plots in which we identified plant species and measured height, percent cover, depth to permafrost, and number and height of hummocks. We referenced all locations with a GPS unit. In addition, we collected CO_2 measurements from different tundra types. While collecting this data, we learned about tundra habitat and how it is susceptible to warming trends. From the native Chukotkans, we learned how important tundra plants are as a food source and as a habitat for the birds and mammals on which they depend.

BACKGROUND

Anadyr is the capital of Chukotka, a region in the far north-east of Russia. This city of 10,000 is situated on the Anadyr Estuary, where the Anadyr River meets the Bering Sea. The Kazachka River runs along the west side of town. On the south side of the city is a large area of low tundra hills and flat lands and to the north are high hills. Dominating the city is a coal-fired power plant which supplies all the electricity, but leaves a layer of ash and dust on the surrounding tundra, and in the air in town. Mining of coal, gold and other metals and petroleum development are the main industries, and large petroleum reserves have been identified for future development. Still, the area surrounding Anadyr is rich in wildlife resources and is very important for many species of bird and plants.

Birdlife International and the National Audubon Society have designated Anadyr Estuary as an Important Bird Area (IBA), because it plays such a critical role in maintaining and supporting migratory bird populations. The surrounding Anadyr Estuary isn't important just for birds, though. The estuary is home to many species of fish and marine mammals crucial for the survival of Anadyr and other Chukotka villages. In a place where a large percentage of the food is imported, thriving salmon fisheries are essential. Although petroleum and mining are immediate threats to Arctic environments, climate change is posing a potential danger to the habitats in the northern latitudes, and seems likely to threaten the habitat around Anadyr as well.

Importance of Carbon Dioxide in Climate Change Carbon is the building block of all the molecules important to life because it has the ability to form bonds with many kinds of elements to form huge molecules. When its bonds are freed during combustion, it rapidly bonds with two oxygen molecules, forming Carbon Dioxide in the atmosphere. CO_2 is considered a greenhouse gas because it traps long-wave radiation that comes from the Earth and keeps it from exiting to space. Instead, the radiation causes the CO_2 molecule to vibrate and generate even more long-wave radiation. Long-wave radiation is also known as heat. Lesser amounts of CO_2 keep Earth's temperature warm and suitable for sustaining life. Too great an increase in CO_2 levels might cause a rise in temperature, resulting warming climates especially in northern latitudes.

Study Goals

The purpose of our study was to learn about and document the natural habitat surrounding Anadyr, and to record data for use in future climate change studies. According to the oral histories we collected from town elders and from younger people, the climate in Anadyr is clearly warming. We wondered how that might be changing the local plant and animal populations, but since there was not any data for comparison we decided to create a database of our own. Also, by talking about the importance of the Anadyr Estuary with people living in the town, we hoped to raise awareness about the importance of the area to wildlife and encourage its protection.

STUDY AREAS

We chose three different habitats to study. Bird surveys were conducted on all three areas and plant surveys and CO_2 measurements were conducted in one area.

These study areas are:

1) **City** The city transect ran along the main street 'Otke', from the Lyceum (the college preparatory school where we stayed) to the west end of Otke Street at the Children's Creativity Palace. The street was the busiest in Anadyr, and had few shrubs and trees lining the street. As it was still early spring there were no leaves on the trees yet;

2) **River** The river transect ran along the Kazachka River. The transect began at the bridge on the northwest end of the river, by the College (high school). It followed the river to the southwest, where the Kazachka Road crosses the river before turning to the east. The river is about 30 m wide and is bordered by a narrow strip of vegetation with a road to the west and buildings to the east.

3) **Tundra** Our tundra study site was an area 500m x 500m. It was chosen because it was the nearest area of dwarf-shrub tundra habitat to town, and was accessible with an hour-long walk. More natural tundra occurred further south of town but was unreachable in the time allotted. The east edge of the tundra plot was disturbed by vehicle tracks, with exposed areas of peat. It was also drier and grassier.

The north and west edges were bounded by wetlands near the river and had standing water of about 10 – 30 meters. The south end extended for many miles with habitat similar to the study plot. The coal plant was about 800 m to the north.

Fig. 1 Map of study areas

Study Site Name	Length/area	Location
Otke Street Transect	1000m	Lyceum to the Children's Palace
Kazachka River Transect	1900m	Northwest Bridge to Southwest Bridge 64°43'52.60" N, 177°32'04.59" E *to* 64°43'17.40" N, 177°30'31.90 E
Tundra Plot	25,000 m^2	1 KM Southwest of coal power plant 64°43'04.71"N, 177°29'36.33 E

Table 1. Study site descriptions

MATERIALS AND METHODS

Bird Surveys

Materials. We used 10 x 40 Zeiss binoculars and a 40-60 x Nikon telescope to find and identify birds. We used a video recorder to record bird behavior. We used *Birds of East Asia* by Mark Brazil, and A *Bird List of Anadyr* by Pavel Tomkavich to help in identification.

Methods. For the tundra study area, all bird species within 500 m of the center of the tundra plot were identified and counted during a 30-minute period on four separate visits. For the river study, we conducted three counts of all birds in the river basin from the southwest to northwest bridge. For the city study, we conducted four counts of all birds seen on Otke Street from the Lyceum to the Children's Palace.

Habitat Surveys

Materials. We used a measuring tape to define meter-square plots that were randomly chosen within the tundra study area. We used rulers to measure plant and hummock height, #2 pencils to judge depth to permafrost, and a compass to gauge slope and aspect. We used a GPS unit to determine coordinates for the plots.

Methods. For each plot we measured temperature, slope and aspect, depth to permafrost, level of saturation, and wind direction. We identified and estimated percent cover of each species of plant in the plot, and measured the height of the tallest plant.

CO2 Off-gassing surveys

Materials. To collect carbon samples, we used Gastec GV-50ps gas collection pump and 0.03-1.0% CO_2 glass detection tubes that change color according to the percent concentration of CO_2 detected. We also used black plastic bags, stones to hold the bags in place, and a knife for puncturing the bag when taking measurements.

Methods. We trapped CO_2 by placing black plastic bags over a .5 square meter plot in the tundra, and weighted down the edges with stones. After 24 hours we punctured a hole in the plastic and placed the glass metering tube in the hole and slowly pulled back the syringe-like part of the Gastec device. This drew the CO_2 into the test-tube giving us the amount of CO_2 that the plot had given off. Finally we recorded the results of each of the experiments and compared the data found.

RESULTS

Bird Surveys.

By far, the bird found in greatest abundance on the transects was the Vega Gull. Similar to Alaska's Herring Gull, the Vega Gull was a common sight in all three study areas. With its relatively dark back, dark wing tips, and large size, it was readily identifiable from the second-most common gull – the glaucous gull, which was nearly white, and more common closer to the water. Brant geese were the most common bird overall, as hundreds to thousands were seen flying high overhead to the west in the evening, heading up the Anadyr River.

Species	Russian name	Survey sites		
		Tundra	River	City
NORTHERN PINTAIL	Шилохвость	8	16	0
LONG-TAILED DUCK	Морянкка	2	3	0
COMMON EIDER	Обыкновенная гага	2	6	0
EURASIAN TEAL	Чирок-свистунок	8	5	0
BRANT	Черная казарка	17	75	0
BLACK SCOTER		0	3	0
HARLEQUIN DUCK		0	2	0
GREATER SCAUP		0	7	0
COMMON SNIPE	Обыкновенный бекас	7	2	0
WHITE WAGTAIL	Белая трясогузка	10	9	8
GLAUCOUS GULL	Бургомистр	13	87	27
TEMMINK STINT	Белохвостый песочник	7	13	1
DUNLIN	Чернозобик	0	6	0
BLACK-BELLIED PLOVER	Тулес	2	3	0
WHIMBREL		1	0	0
RUDDY TURNSTONE		0	2	0
RED PHALAROPE		0	4	0
RED-NECKED PHALAROPE	Круглоносый плавунчик	4	24	0
PECTORAL SANDPIPER		0	8	0
LONG-TOED STINT		1	1	0
RUFF		7	9	0
WOOD SANDPIPER	Фифи	8	12	0
ARCTIC TERN	Полярная крачка	0	1	0
VEGA GULL	Серебристая чайка	27	296	121
SLATY-BACKED GULL		0	0	1
LONG-TAILED JAEGER		1	0	0
BONAPARTE'S GULL		0	3	0
ROSS' GULL		0	1	0
WILLOW PTARMIGAN		1	0	0
SHORT-EARED OWL		4	0	1
SANDHILL CRANE		6	0	0
NORTHERN WHEATEAR		0	0	1
YELLOW WAGTAIL	Желтая трясогузка	3	12	9
NORTHERN HOUSE MARTIN		0	0	20
GRAY WAGTAIL	Серая трясогузка	1	0	0
NORTHERN RAVEN	Ворон	4	5	2
BLUETHROAT	Варакушка	2	0	0
SNOW BUNTING	Пуночка	0	3	4
LAPLAND LONGSPUR	Папландск. Полорожник	4	0	0
HOUSE SPARROW	Домовый воробей	0	13	27

Table 2. Average number of birds seen in each transect/site

In the city, the most common birds besides gulls were the house sparrows, which locals say come in container ships and are recently able to overwinter because of heating pipes under the buildings. Rock Doves also were common (about 35 total), but weren't seen on the transect. White and yellow wagtails brightened the town, with white being present when we first arrived, and yellows coming in a few days later. Temminks stints and wood sandpipers were common around the small pools. Temminks have started to defend territories and were very vocal. Ruffs were found in both the river and tundra habitats, and fortunately set up a lek in the tundra study area. We spent several hours on three occasions observing lekking behavior. The white male ruffs appear to be less dominant than the brown and red ruff males, and that the darkest male was the most dominant of all. The northern pintail duck was common and reminded us of Alaska, where it is also common. Another special bird of the tundra was the bluethroat, which sang a variety of bird songs, and even gave what might have been cricket sounds, learned on its African wintering grounds. The rarest bird we saw might have been the Ross' gull, which was small, and had a black stripe on the back of its neck. Out-of-place birds were the Arctic Tern and Bonaparte's gulls. A total of 51 birds were seen on the trip.

Habitat Surveys.

The tundra plot was characterized by plants less than 40-cm tall, and by many small shrubs and other plants (forbs). This type of habitat is called dwarf-shrub tundra. The most common were the dwarf shrubs alder (*Betula)*, and willow (*Salix)*, low bush cranberry (*Vaccinium vitas-idea)*, Labrador tea (*Ledum)*, crowberry (*Empetrum)*, sedges (*Carex* and *Eriophorum).*

	Plot Number								
	1	2	3	4	5	6	7	8	Ave.
Temperature (degrees C)	5	5	7	4	4	5	7	6	5
Slope/aspect	0/0	0/0	0/0	4/N	3/N	5/E	0/0	0/0	-
Depth to permafrost (cm)	7	1.5	1.5	4	2	1.5	10	8	4.4
Lowest to highest surface point	26	13	19	22	24	29	21	44	24.8
Level of saturation	dry	dry	dry	moist	moist	dry	moist	dry	-
Number of hummocks	0	0	1	1	1	3	1	3	1.3
Carex (sedge)	0%	35%	2%	5%	8%	60%	40%	70%	77.0%
Calamagrostis (sedge)	0%	0%	0%	1%	3%	25%	8%	10%	31.5%
Vaccinium (lingonberry) брусника	30%	15%	10%	30%	50%	30%	8%	10%	3.9%
Salix (*Dwarf Willow)* ива	5%	0%	10%	30%	0%	4%	0%	0%	24.3%
Arctostaphylos (bearberry) волчья ягода	0%	0%	2%	20%	0%	20%	0%	0%	25.2%
Ledum (Labrador tea) багульник	15%	20%	50%	20%	40%	15%	26%	75%	21.8%
Empetrum (crowberry) шикша	0%	5%	10%	0%	3%	25%	8%	5%	40.4%
Betula Dwarf Alder карликовая ольха	15%	45%	75%	0%	30%	20%	35%	65%	32.3%
Rubus Cloudberry морошка	3%	1%	0%	2%	1%	0%	0%	1%	75.0%
Lichen ягель	45%	10%	25%	6%	10%	0%	0%	2%	12.0%
Moss мох	0%	3%	50%	20%	25%	25%	0%	5%	32.5%
Height of tallest shrub (cm)	20	23	39	30	43	23	24	43	30.6

Table 3. Percent cover and height of tundra plants in study plots

CO_2 Surveys.

We tested CO2 off-gassing in three types of tundra. The first was forb-dominated tundra, which was the type of considered to be in its most natural state for this area. The second type was grass-dominated tundra, which had many of the same plants but also had a lot of *Calamagrostis*; this type of habitat seemed to be closer to the areas where there was a lot of disturbance from vehicles. The third kind of habitat tested was peat-dominated, which meant that there was no tundra cover and the underlying peat was exposed, due to vehicle disturbance.

Tundra Plant Type	Percent Composition CO2
Forb-dominated #1	0.03
Forb-dominated #2	0.03
Forb-dominated #3	0.03
Forb-dominated #4	0.03
Forb-dominated #5	0.03
Grass-dominated #1	0.03
Grass-dominated #2	0.03
Grass-dominated #3	0.03
Peat-dominated #1	0.07
Peat-dominated #2	0.07

The results of the carbon survey indicate there was no difference between grass and forb-dominated tundra. In fact, when testing plain air in the tundra we came up with the same result – 0.03% CO_2. However, in the absence of tundra cover plants, the CO_2 off-gassing increased by more than 100%.

DISCUSSION

All of the data we took during our brief stay in Anadyr can be used as baseline data for future studies on the changing environment in Chukotka. Birds are excellent indicators of habitat quality for many reasons. As a group, birds are omnivorous and eat many of the same things humans do, but respond to changes in the food base more quickly. Also, birds are easy to see and identify, so if they are monitored in the environment, a sharp increase or decline in population could be an indicator for a major change that could affect humans. Also, since bird types reflect climate conditions, a slowly changing make-up of birds would be seen as the climate warms.

Winters become warmer, the frozen tundra thaws faster each spring. Plants that evolved to grow on top of frozen ground will become less common as grasses, shrubs and other fast growing plants with deeper roots take over. Over time, as the tundra warms the types of plants that used to dominate the tundra will become less and less common, leading to a decreased biodiversity in the Chukotkan tundra. We hope our vegetation plot data can be used to chart change in plant biodiversity over time.

As permafrost thaws, the peat soils undergo decomposition by increased microbe activity, which turns carbon that had remained trapped for centuries into even more CO_2. We knew that over time as the tundra warms, this process will allow more CO_2 to be given off. After analyzing results from our CO_2 data, we discovered that exposed peat moss gives off many times more CO_2 than intact tundra. If humans continue to destroy large sections of tundra, even more CO_2 will be given off.

CONCLUSION

Even though we were only taking data for about ten days in the early summer of Anadyr, before the estuary ice melted, before many of the plants turned green, or many of the bird species had returned, we could see that the natural environment was supporting a variety of wildlife. We hope that climate change will not affect the beauty we saw in the tundra.

We also learned about the role that Anadyr Estuary plays in the migration of birds, and that these migrations link Anadyr to the great estuaries of the world, some of which are suffering huge habitat losses. Although it is iced over longer than others, Anadyr Estuary seems to offer a healthy habitat. As the climate warms, more and more species of birds might come to Anadyr as they lose habitat in the south. Fish are already doing that. It is our theory that as the climate warms, the Anadyr Estuary - already an internationally recognized Important Bird Area - might become home to southern species and thus may become even more critical. We hope that Anadyr Estuary, and all estuaries, will be protected for the benefit of both wildlife and humans.

Bird Team:	Noah Warnock	Aviva Hirsch	Mariah Savoie
	Dasha Starovoitova	Diana Tinye	Tatiana Sorokovenno
Plant Team:	Zoe Danner	Lizzie Bjorklund	Victoria Rul'tine
	Natasha Adler		
Carbon Team:	Rachelle Russo	Oleg Vorobyov	Thomas Sawden

Турухтаны
Ruffs

Observations of a Lek
by Tatiana Sorokovenn and Diana Tinye

Мы наблюдали птиц при помощи бинокля и телескопа с достаточно близкого расстояния. При этом часть птиц (3 особи мужского пола) находилась у озера, а другая часть (2 особи женского пола) - на возвышенности, примерно в 7 метрах от озера.

We watched birds with the aid of binoculars and a scope at a close distance. Three male birds were located near the lake, and two females were about seven meters from the lake.

Спустя 5 минут самцы перестали поглощать пищу у озера. Двое из них коричневого окраса скрылись в траве, а самец белого цвета полетел в сторону самок. Как только самец белого окраса подошел к самкам серого цвета его поведение резко изменилось: он оживился, раскрыл свой «воротник» и начал чистить перья. Затем он начал «танцевать», махая то одним крылом, то другим, иногда невысоко взлетая в воздух.

After five minutes the males stopped feeding near the lake. Two of the brown males hid in the grasses, while the white male flew in the direction of the females. As soon as the white male approached the grey females, his behavior changed sharply: he became lively, showed his «ruff» and began to clean his feathers. Subsequently he began to «dance,» waving first with one wing, then the other, sometimes flying a short distance into the air.

Но тут появились 2 самца коричневого окраса, которые также были с распущенными «воротниками» и начали прогонять белого турухтана. Ему пришлось отойти в сторону. Когда самец белого цвета спустился с возвышенности, на которой находились самки, его «воротник» вернулся в «положение покоя».

But here two brown males appeared which also had their «ruffs» showing, and they began to chase off the white ruff. He had to move off to the side. When the white male came down from the hillock on which the females were sitting, his «ruff» returned to the «peaceful position.»

Однако белый самец не хотел сдаваться и пытался подойти к месту дислокации особей женского пола. Но самцы коричневого окраса, находившиеся там, не давали ему этого сделать, постоянно прогоняя белого турухтана, который был вынужден скрыться в траве.

However, the white male didn't want to give in and he tried to go up to the new location of a special white female. Then the brown males who were located there didn't allow him to approach, contantly running off the white male, who had to hide in the grass.

Затем, один из коричневых самцов улетел. А самки спустились с возвышенности и начали кормиться у водоёма. Тогда, коричневый самец, заметив, что на него не обращают внимания, убрал

свой «воротник» и начал чистить перья.

Then one of the brown males flew off and the females came down from the tussock and began to feed near the water. The brown male, noticing that they weren't paying him any attention, relaxed his «ruff» and began to clean his feathers.

Потом самки улетели. Таким образом, в зоне видимости были: один белый самец и один коричневый. Мы заметили, что борьбы между самцами не происходило, хотя они были на близком расстоянии друг от друга.

Then the females fles away. Thus in the viewing site there were remaining only one white male and one brown. We noticed that there were no battles between the males, although they were in close proximity to each other.

Спустя некоторое время на горизонте появилась самка. Самец коричневого окраса, заметив самку, расправил свой синий «воротник» и начал преследовать её. Белый самец ходил следом, возможно, пытаясь составить конкуренцию самцу коричневого цвета.

A little while later a female appeared on the horizon. The brown male, having noticed the female, unfolded his «ruff» and began to follow her. The white male followed them, possibly trying to start a competition with the brown male.

Неожиданно появился самец черного окраса. В этот момент все особи турухтана исчезли из виду. По прошествии нескольких минут, черный турухтан улетел на другое место. После чего из укрытия вышел коричневый самец, с опущенным «воротником». Завидев самку, он распустил свой «воротник». Не обратив на него внимания, она улетела. Через несколько минут самец сделал тоже самое, возможно, последовав за ней.

Unexpectedly a black male appeared. At this moment all the other Ruffs disappeared from view. After several minutes, the black male flew away to another area. After this the brown Ruff male came out of hiding with a flattened «ruff.» Having seen the female, he puffed out his «ruff.» Not paying any attention to him, she flew away. After several minutes the male did the same, possibly following her.

Таким образом, мы узнали, что при появлении самки самцы турухтана расправляют свой «воротник» , тем самым привлекая к себе внимание, а при появлении соперника начинается борьба за территорию и самку. Мы пришли к выводу, что :

In such a manner, we found that when females appear, the male Ruffs puff out their «ruff,» thus attracting attention, and when a rival appears, a battle for territory and female starts. We came to the conclusion that:

- самцы белого окраса «слабые», поскольку их выгоняют с территории, на которой находится самка;
- самцы черного цвета «сильные», потому что при их появлении все остальные особи пытаются скрыться.

--the white male Ruffs are «weaker,» inasmuch as the others chase them from the territory where the females are located;
the black male Ruffs are «strong,» because when they appear all the other Ruffs try to hide.

Совместный русско - американский экологический проект 2011

Молодёжь Аляски и Чукотки уже третий год участвует в совместном международном экологическом проекте «Ground Zero». И в этом году по приглашению ГОУ «Чукотский окружной профильный лицей» на Чукотку прибыли гости из Америки: 2 преподавателя и 8 учащихся 14-17 лет школы West High города Анкориджа, нацеленных решать важные и общие для Аляски и Чукотки экологические проблемы.

Цель проекта - сбор данных о климатических условиях, флоре и фауне окрестностей Анадырского лимана, а также исследование роли Анадырского лимана как возможного места для гнездовья большего количества видов мигрирующих птиц.

26 мая 2011 группа американцев прибыла в лицей. После долгого перелёта и сложной дороги ребятам требовалось отдохнуть. После обеда в компьютерном зале произошло первое знакомство. 8 подростков из Америки познакомились с ребятами из России, тоже участвующими в проекте. Преподаватели подготовили много увлекательных, весёлых и интересных игр. Каждый рассказал о себе, своих интересах, хобби, о любимых предметах и любимых местах. Вечеринка знакомства удалась :-) !!! После этого учащимися лицея была проведена экскурсия по нашему учебному заведению. Американцам лицей понравился.

27 мая с самого утра погода стояла прекрасная и американская делегация в сопровождении русских ребят отправилась на экскурсию по Анадырю. Мы показали основные достопримечательности города. После экскурсии мы вернулись в лицей, чтобы непосредственно заняться проектом. Были сформулированы основные цели и задачинашей дальнейшей работы, гипотезы и методы исследования. Все участники проекта разбились на четыре группы — кто-то занимался изучением птиц, кто-то растениями, кто-то замерял уровень выхода

углерода. Были и те, кто освещал всё это, записывая ход работ, фотографируя юных исследователей и описывая происходящее в статьях.

В субботу, 28 мая, для гостей была предусмотрена увекательная программа. Ранним утром мы впервые отправились в тундру проводить эксперименты и наблюдать за птицами. Мы осознали, что совсем мало знаем о птицах и растениях Чукотки. В этот день наш словарный запас значительно пополнился новыми терминами (причем как по-русски, так и по-английски). После обеда мы отправились на отчётный концерт всемирно известного чукотско-эскимосского танцевального ансамбля «Эргырон». Это было прекрасно. Все были заворожены пластикой танцоров, древними чукотскими танцами, костюмами и прекрасной музыкой. В этот же день состоялся ещё один концерт - современного брейк-данса.

День 29 мая был полностью посвящён работе над проектом. Сара Уорнок рассказала о своей деятельности по изучению проблем изменения миграционных путей птиц. Именно в этот день была высказана мысль о всё возрастающей роли Анадырского лимана как возможного места для гнездовья новых видов птиц в условиях изменения путей их миграции. В связи с этим перед нами встала задача собрать данные о состоянии флоры и фауны Анадырского лимана на сегодняшний день и отметить изменения, которые произошли на протяжении последних 10 лет, основываясь на рассказах местных жителей, рыбаков и охотников.

На следующий день пока русские ребята сдавали ЕГЭ по русскому языку, американские ребята продолжали знакомиться с культурой Чукотки в косторезной мастерской школы искусств. На этой экскурсии прямо на их глазах из-под резца мастера вышло настоящее произведение искусства, сделанное из клыка моржа. После этого они отправились на мастер-класс национальных танцев Чукотки под руководством Влада Ринтытегина. Это было очень интересно. Ребята учились понимать смысловое наполнение танцев, показывать растения и

животных посредством движений. Теперь они понимают, что Чукотские танцы — это не простой набор движений, а рассказ о жизни и культуре целого народа.

31 мая, во вторник, с самого утра у американских ребят прошел первый урок русского языка, который проводила Галина Николаевна Михайлова. Ребятам сразу понравился наш богатый и красивый язык. После обеда Влад Рыльтытерин повторил свой мастер-класс для гостей. Вечером в сопровождении телевидения и учителя истории и обществознания, охотника и рыболова, а также знатока местной тундры Бахши Левоновича Мамуляна мы отправились на природу. Благодаря Бахши Левоновичу, мы узнали, что только вместе, помогая друг другу можно выжить в суровых условиях Чукотки. Мы произвели замеры выхода CO2 на участке поврежденной и неповрежденной тундры, посчитали процентное соотношение растений на одном квадратном метре неповрежденной тундры, а также наблюдали за птицами, обитающими на реке Казачке. Ребята дали интервью для местного телевидения и рассказали о ходе проекта.

Среда 1 июня день начался с полевых работ в тундре, где ребята наблюдали за поведением птиц и отмечали численный и видовой состав птиц, обитающих вокруг Анадыря. А после обеда уставшие, но довольные проделанной работой, все отмечали праздник — День защиты детей. В школе искусств была подготовлена праздничная программа, в которой были представлены вокальная, танцевальная и музыкальная студии. Вечером ребята отрывались на дискотеке в лицее. Особенно на долго она запомнилась Рейчел и Мишель.

В четверг с самого утра американские гости отправились на очередной урок русского языка. Они выучили слова песен «Подмосковные вечера», «Солнечный круг», «Катюша», а также инсценировали сказку «Курочка ряба». В музее «Наследие Чукотки» продолжилось знакомство с историей и культурой нашего округа. После обеда в спортивном зале лицея состоялись спортивные соревнования «Весёлые старты». Не обошлось без потерь — Оксана Нетёсова

повредила колено.

3 июня в то время, как 11-классники сдавали ЕГЭ по английскому языку, американские ребята продолжали изучение русского языка и ходили на экскурсию в храм Святой Живородящей Троицы. Ребятам понравилась атмосфера в храме и необычные резные иконы. На память они купили рушники, свечи, иконки и масло. Вечером мы снова все вместе продолжили работу над проектом, обрабатывая сведения, собранные нами ранее в тундре.

4 июня выдался не менее интересным. До обеда мы ходили наблюдать за птицами на реке Казачке. Удалось увидеть турухтанов, тулесов, круглоносых плавунчиков, чернозобиков, белохвостого песочника, шилохвость, пуночек, обыкновенных бекасов, жёлтую и белую трясогузку. После обеда русские ребята обучали иностранных гостей готовить национальные русские блюда — блины и бублики, пироги и яблочный пирог. Отведав приготовленные совместно блюда, напившись чая с вареньем и конфетами, мы играли в разные игры и пели песни. Вечер выдался очень интересным.

5 июня был полностью посвящён работе над проектом. С утра мы отправились в тундру наблюдать за птицами, измерять уровень выхода углерода и изучать растительный состав тундры. Вечером подводили итоги проделанной работы и занимались подготовкой материалов для итоговой презентации проекта.

6 июня выпускники сдавали ЕГЭ по математике, пока американские ребята снимали последние показания по выходу углерода. Этот день стал очень важным для Зои. Ей исполнилось 15 лет. После обеда состоялась итоговая презентация проекта, где каждая группа представила отчет о проделанной работе. Вечером ребята прощались друг с другом, потому что на следующее утро американская группа покидала Анадырь очень рано :-(